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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,187	02/09/2004	Kia Silverbrook	MTB31US	8432
24011	7590	03/13/2006	EXAMINER	
SILVERBROOK RESEARCH PTY LTD 393 DARLING STREET BALMAIN, NSW 2041 AUSTRALIA			FIDLER, SHELBY LEE	
			ART UNIT	PAPER NUMBER
			2861	

DATE MAILED: 03/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,187

Applicant(s)

SILVERBROOK, KIA

Examiner

Shelby Fidler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-54 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/9/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/16/2004</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Objections

Claims 18 and 37 are objected to because of the following informalities: line 1 of each claim recites "each heater element is substantially covered . . . such that the coating is seamless." This statement is unclear since a substantially covered element would not be seamless. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 6, 8, 10, 11, 13, 14, 19, 20, 23, 24, 25, 27, 29, 30, 32, 33, 38, 39, 42, 43, 44, 46, 47, 49, and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Silverbrook (US 6019457).

Silverbrook teaches the following:

***regarding claims 1, 19, and 38, an inkjet printhead (col. 5, lines 60-61) and printing system (Figure 116) comprising:**

a plurality of nozzles (col. 1, lines 64-65), each defining a nozzle aperture having a central axis (Z-axis, col. 2, lines 53-56);

a bubble forming chamber corresponding to each of the nozzles respectively (chamber 113, Figure 9);

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at least one heater element disposed in each of the bubble forming chambers respectively (*heater 120, Figure 9*), the heater element configured for thermal contact with a bubble forming liquid (*heater 120 in thermal contact with ink 106, Figure 12*); such that

heating the heater element to a temperature above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a drop of an ejectable liquid through the nozzle corresponding to that heater element (*col. 9, lines 26-28*); wherein,

the heater element (*heater 440, Figure 10*) is configured to nucleate the gas bubble at two or more regions (*main heater 441 and redundant heater 443, Figure 13 with col. 9, lines 30-33*) such that each nucleation region is laterally offset from the nozzle aperture (*each is offset from nozzle aperture 445, Figure 13*)

***further regarding claim 38**, supplying the nozzle with a replacement volume of the ejectable liquid equivalent to the ejected drop (*col. 12, lines 59-61*)

***regarding claims 2, 20, and 39**, the heater element has two bubble nucleation regions (*elements 441 and 443, Figure 13*)

***regarding claims 5, 24, and 42**, the bubble forming liquid and the ejectable liquid are of a common body of liquid (*col. 9, lines 26-30*)

***regarding claims 6, 25, and 43**, the printhead is configured to print on a page and to be a page-width printhead (*col. 2, lines 19-22*)

***regarding claims 8, 27, and 44**, each heater element is configured such that an actuation energy of less than 500 nanojoules is required to be applied to that heater element to heat that heater element sufficiently to form the bubble in the bubble forming liquid thereby to cause the ejection of the drop (*col. 19, lines 8-10*)

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***regarding claims 10, 29, and 46**, the printhead comprises a substrate having a substrate surface, wherein the areal density of the nozzle relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface (*using the reference measurement of Figure 43 and counting the individual nozzles disclosed in the "part of cyan" section of Figure 43, calculations show*

that the density exceeds 10,000 per square cm:
$$\frac{20\text{nozzles}}{0.0016384\text{cm}^2} = 12207 \frac{\text{nozzles}}{\text{cm}^2}$$

***regarding claims 11, 30, and 47**, each heater element (*element 120, Figure 17*) has two opposite sides (*left and right sides of chamber respectively, Figure 17*) and is configured such that the gas bubble formed by that heater element is formed at both of the sides of that heater element (*bubble 198 formed on both sides of chamber, corresponding to both sides of element 120, Figure 17*)

***regarding claims 13, 32, and 50**, the printhead comprising a structure that is formed by chemical vapor deposition , the nozzles being incorporated on the structure (*col. 5, lines 47-49*)

***regarding claims 14, 33, and 49**, the printhead comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure (*col. 9, lines 8-10*)

***regarding claim 23**, the system is configured to support the bubble forming liquid in thermal contact with each heater element (*col. 17, lines 37-43*), and to support the ejectable liquid adjacent each nozzle (*col. 17, lines 37-40*)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 21, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Gerber et al. (US 6680668 B2).

Silverbrook teaches the following:

***regarding claims 3, 21, and 40,** the heater element has two parallel spans disposed on either side of the nozzle aperture axis (*element 441 is parallel to element 443, Figure 13*), such that each of the spans has one of the bubble nucleation regions ()

Silverbrook does not expressly teach the following:

***regarding claims 3, 21, and 40,** the heater element is suspended

Gerber et al. teaches the following:

***regarding claims 3, 21, and 40,** the heater element is suspended (*col. 4, lines 31-32*)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Silverbrook's heater element to be suspended. The motivation for doing so, as taught by Gerber et al., is so that the resistor will quickly increase in temperature since the heat is not absorbed by the substrate (*col. 4, lines 32-38*)

Claims 4, 7, 15, 16, 18, 22, 26, 34, 35, 37, 41, 51, 52, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Anagnostopoulos et al. (US 6502925 B2).

Silverbrook teaches the following:

***regarding claims 15, 34, and 51,** a plurality of nozzle chambers each corresponding to a respective nozzle (*col. 7, lines 42-44*)

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Silverbrook does not expressly teach the following:

***regarding claims 4, 7, 22, 26, and 41**, the heater element is formed predominately from titanium nitride

***regarding claims 15, 34, and 51**, a plurality of heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another

***regarding claims 16, 35, and 52**, each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50

***regarding claims 18, 37, and 54**, each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless

Anagnostopoulos et al. teaches the following:

***regarding claims 4, 7, 22, 26, and 41**, the heater element is formed predominately from titanium nitride (*col. 10, lines 32-34*)

***regarding claims 15, 34, and 51**, a plurality of heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another (*col. 8, lines 36-38*)

***regarding claims 16, 35, and 52**, each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 (*Ti and TiN, col. 10, lines 31-33*)

***regarding claims 18, 37, and 54**, each heater element is substantially covered by a conformal protective coating (*protection layer, col. 10, lines 26-28*), the coating of each heater

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element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless (*col. 10, lines 26-39 with Figure 5*)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Silverbrook's heater elements to be formed predominately from titanium nitride. The motivation for doing so, as taught by Chan (US 5870121), is to take advantage of TiN's highly stable and highly resistive characteristics (*col. 5, lines 11-22*).

Claims 12, 31, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Campbell et al. (US 4870433).

Silverbrook teaches the following:

***regarding claims 12, 31, and 48,** the bubble which each element is configured to form is collapsible (*bubble 116 collapse onto the heater elements, Figure 29*)

Silverbrook does not expressly teach the following:

***regarding claims 12, 31, and 48,** each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element

Campbell et al. teaches the following:

***regarding claims 12, 31, and 48,** each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element (*col. 3, lines 60-64*)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to configure Silverbrook's heater elements to form bubbles with a point of collapse that is spaced from the heater element. The motivation for doing so, as taught by Campbell et al., is to prevent cavitation damage to the heater elements (*col. 3, lines 14-23*)

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Claims 9, 28, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Tajima et al. (US 5867200).

Silverbrook teaches the following:

***regarding claims 9, 28, and 45,** the printhead is configured to receive a supply of ejectable liquid at an ambient temperature (*col. 13, lines 47-50 shows that the supplied ink is cooler than the operating ink since it cools the printhead*)

Silverbrook does not expressly teach the following:

***regarding claims 9, 28, and 45,** each heater element is configured such that the energy required to be applied thereto to heat the part of cause the ejection of a drop is less than the energy required to heat a volume of the ejectable liquid equal to the volume of the drop, from a temperature equal the ambient temperature to the boiling point

Tajima et al. teaches the following:

***regarding claims 9, 28, and 45,** each heater element is configured such that the energy required to be applied thereto to heat the part of cause the ejection of a drop is less than the energy required to heat a volume of the ejectable liquid equal to the volume of the drop, from a temperature equal the ambient temperature to the boiling point (*col. 2, lines 38-49 shows that a pre-heat pulse of energy is required to heat the ambient temperature before applying the ejection pulse of energy; therefore, less energy is required when the ink is not at ambient temperature and no pre-heat pulse is required*)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify Silverbrook's invention so that it takes less energy to heat the operating ink to eject a droplet than to heat ambient ink to eject a droplet of the same volume. The motivation for doing so, is to use less energy to eject a droplet of ink.

Claims 17, 36, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457).

Silverbrook teaches the following:

***regarding claims 17, 36, and 53, each heater element includes solid material ()**

Silverbrook does not expressly teach the following:

***regarding claims 17, 36, and 53, each heater element is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above the boiling point thereby to heat the part of the bubble forming liquid to a temperature above the boiling point to cause the ejection of a drop. At the time of invention, it would have been obvious to a person of ordinary skill in the art to configure the heater element for a mass of less than 10 nanograms of the solid material to be heated, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The motivation for doing so, would be to use less materials.**

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Communication with the USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shelby Fidler whose telephone number is (571) 272-8455. The examiner can normally be reached on MWF 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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K. FEGGINS
3/00
PRIMARY EXAMINER